



U.S. DEPARTMENT OF
ENERGY

Office of
Science

HEP Research Program Status

HEPAP Meeting
August 7 2023

Glen Crawford
Research & Technology Division Director
Office of High Energy Physics
Office of Science, U.S. Department of Energy

Outline

Topics:

- ▶ ~~Selected Research Highlights~~ → Gina's talk
- ▶ Funding Opportunities FY23/24
 - ▶ Outcomes
 - ▶ Early Career winners
 - ▶ Changes for FY24
 - ▶ HEP PI Meeting!
- ▶ Office Comings and Goings

Intensity Frontier: New Muon g-2 Results



Curtain going up... Thu Aug 10

FY 2023 HEP Funding Opportunities Recap

Funding Opportunity	Timeline	Notes
FY 2023 Research Opportunities in High Energy Physics	Released 10/19/22 Proposals due 12/21/22	109 applications. 80 awards. Univ only. See following slide.
U.S.-Japan Science and Technology Cooperation Program In High Energy Physics	Released 10/17/22 Proposals due 12/15/22	19 proposals. 11 funded. Lab only
FY 2023 SC Early Career Research Program (SC-wide)	Released 11/16/22 Proposals due 3/23/23	86 HEP proposals. 12 funded. See following slides. Univ + Lab.
RENEW-HEP	Released 1/9/23 Proposals due 3/31/23	Univ + Lab. Under review. Traineeships + Research Infrastructure. See following slides
FAIR (SC-wide, New in 2023)	Released 12/15/22 Proposals due 4/11/23	Univ only. Building research capacity. See following slide
ACCELERATE (SC-wide, New in 2023)	Released 2/16/23 Proposals due 6/7/23	Lab only. Under review.
HEP Traineeships in Accelerator Science and Engineering (re-compete)	Released 4/4/23 Proposals due 6/6/23	Univ only. Under review. Backup slide.

Notes on FY23 HEP Comparative Review

- ▶ Total number of applications down from previous years, particularly New (as opposed to Renewal) proposals
- ▶ Total number of awards (both New and Renewal) was fairly typical, so → higher success rate, particularly for New applications.
- ▶ Awards include:
 - ▶ ~12 new junior Pis (not including new Jr Pis on “umbrella” awards)
 - ▶ 14 awards to EPSCOR states (new.nsf.gov/funding/initiatives/epscor)
 - ▶ 13 awards to Emerging Research Institutions (<\$50M/yr Fed R&D)
 - ▶ 14 awards to Minority Serving Institutions (mostly R1s)
 - ▶ 0* awards to new institutions (not previously funded by HEP), HBCUs
 - ▶ RENEW, FAIR to develop new research capacity

*NB: application from US Naval Academy (Jr PI, ERI) awarded via SC Open Call

RENEW in Context of HEP

SC RENEW Goals:

- ▶ RENEW aims to build foundations for the Office of Science (SC) research at institutions historically underrepresented in the SC research portfolio.
- ▶ RENEW aims to provide the hands-on experiment gained through the initiative will open new career avenues for a future pool of talented scientists, engineers, and technicians with critical skills and expertise needed for the full breadth of SC research activities.

• RENEW-HEP:

- ▶ **HEP seeks to broaden and diversify the high energy physics community.**
- ▶ Some of the barriers identified in improving diversity and equity in HEP include: lack of sufficient mentoring, support networks, or recruitment, outreach and professional culture of inclusion at “traditional” HEP research institutions; lack of research infrastructure and support at institutions that have not traditionally received HEP funding, possibly disadvantaging them in the competitive review process; the need for additional support for faculty at institutions with large teaching loads; and general financial barriers to students pursuing degrees in STEM fields. T
- ▶ **This program is informed and influenced by the recommendations reports including the American Institute of Physics TEAM-UP report.**

• RENEW-HEP programmatic goals:

- **1) Supporting investigators and building research infrastructure at institutions which have not traditionally been part of the particle physics HEP portfolio.**
- **2) Encouraging underrepresented populations to pursue STEM careers by providing traineeships and/or support for undergraduate and graduate students, postdoctoral researchers, and faculty at academic institutions not well represented in the HEP research portfolio.**

Recent RENEW HEP Outcomes

- In FY21, HEP co-funded 3 awards with NP for MSI traineeships (proto-RENEW) in accelerator R&D and neutrino research
 - Partnerships included 7 MSI institutions, 6 not previously HEP funded, 3 HBCUs
- In FY22, following an intensive review process, HEP made 14 awards from the RENEW-HEP FOA:
 - 11 university-led (9 MSIs, 2 collabs), 3 lab-led partnerships
 - HEP topics include: CMS, neutrinos, accel R&D, detectors
 - 5 of the lead institutions new to HEP (all MSIs, 2 HBCUs)
 - 7 partner institutions, all MSIs, 4 new to HEP, 1 HBCU
- FY23 RENEW awards to be announced soon

Funding for Accelerated, Inclusive Research (FAIR)

- ▶ FAIR is a new initiative spanning the research scope of the Office of Science aiming to support research at institutions historically underrepresented in the Office of Science portfolio
 - ▶ This includes minority serving institutions (MSIs) and emerging research institutions (ERIs).
 - ▶ FAIR supports mutually beneficial relationships between MSIs and ERIs with partnering institutions to perform basic research
- ▶ FAIR compliments the scope of RENEW by supporting research and building capacity
 - ▶ That research may take advantage of the infrastructure and training developed through RENEW-HEP
- ▶ FY23 FAIR awards to be announced soon

Expanded Outreach to Potential Applicants

- ▶ **In 2022, SC and HEP expanded outreach efforts to broaden participation in SC-sponsored program opportunities.** This included:
 - Public webinars associated with the release of new funding opportunity announcements, e.g.:
 - FY 2023 SC Early Career Research Program [FOA webinar](#)
 - FY 2023 RENEW-HEP [webinar](#), FY2023 FAIR [webinar](#)
 - Increase Office of Science engagement at national professional society meetings (e.g., NSBP, SACNAS)
 - Increased outreach webinar and career fair webinars for internship programs sponsored through the SC [Office of Workforce Development for Teachers and Scientists \(WDTS\)](#)
- ▶ **SC and HEP intend to build on these efforts in the coming year.**
 - ▶ [Sign-up to receive Office of Science announcements!](#)

Promoting Inclusive and Equitable Research (PIER) Plans

- ▶ Beginning in FY 2023, Office of Science solicitations require applicants to submit a plan for **Promoting Inclusive and Equitable Research, or PIER Plan**, along with their research proposals.
 - This is a requirement for proposals submitted to all Office of Science solicitations, as well as invited proposals from the DOE national laboratories.
 - **Formal research proposals (incl. PIER plans) are also now part of lab comparative reviews**
- ▶ PIER Plans are limited to 3 pages and should describe the activities and strategies that investigators and research personnel will incorporate to promote diversity, equity, inclusion, and accessibility in their research projects.
 - The complexity and detail of a PIER Plan is expected to increase with the size of the research team and the number of personnel to be supported.
 - The PIER Plans will be evaluated under a new merit review criterion as part of the peer review process.
- ▶ Additional information and FAQs: <https://science.osti.gov/grants/Applicant-and-Awardee-Resources/PIER-Plans>

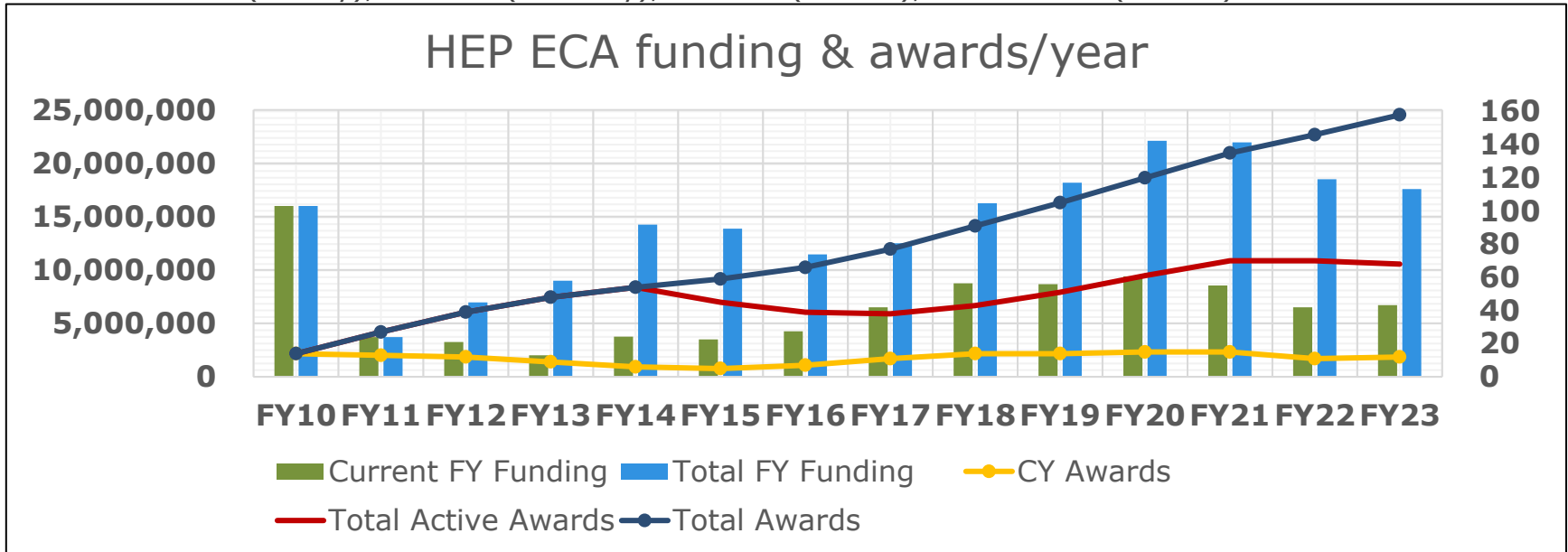
More on PIER Plans

- ▶ Based on reviewer comments, most HEP PIs/institutions took this assignment seriously, and quality of responses was generally good, but there was large variance.
 - ▶ Individual reviewer comments on the PIER plans are included in the redacted anonymous reviews provided to PIs.
 - ▶ Some subprograms are now including panel summary statements on the PIER plan itself, as well as scientific merit and strength of research proposal.
 - ▶ Let us know if you find these evaluations helpful!
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- ▶ PIER is not meant to be a general-purpose exercise in Diversity, Equity, and Inclusion (DEI), nor does it ask for participation in unrelated outreach efforts. **PIER** is **Promoting Inclusive and Equitable Research** and a PIER Plan should describe how inclusivity and equity are to be expressed in the research being proposed, and how senior investigators on the proposal are involved in the effort. A PIER Plan can leverage institutional DEI plans and resources, but it is not enough to simply describe those programs and resources; the PIER Plan must discuss how they are to be implemented in the proposed research. Please look at the information available at: <https://science.osti.gov/grants/Applicant-and-Awardee-Resources/PIER-Plans>.

Increasing Investments to Early Career Research Program

<https://science.osti.gov/early-career>

- ▶ **158 total HEP awards to date:** 90 University and 68 National Labs.
 - ▶ In FY 2023, 12 awards (4 Univ, 8 Lab) including first-time HEP award to PNNL.
- ▶ 4 HEP awards funded by Established Program to Stimulate Competitive Research (EPSCoR)
 - ▶ FY 2011 (Theory), FY 2013 (Intensity), FY 2020 (Cosmic), and FY 2021 (Cosmic)



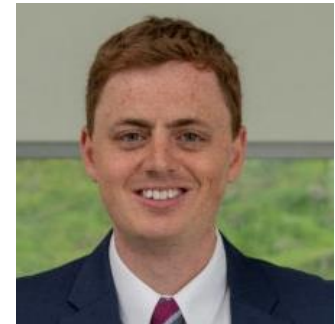
FY 2023 HEP Early Career Awards: University

- ▶ **Masha Baryakhtar, U. Washington**
 - ▶ Shining New Light on the Dark Sector
- ▶ **Clay Cordova, U. Chicago**
 - ▶ Symmetry in Quantum Field Theory
- ▶ **Chris Marshall, U. Rochester**
 - ▶ A multi-experiment approach to neutrino-argon cross section uncertainties
- ▶ **Mikhail Solon, UCLA**
 - ▶ Quantum Field Theory Tools for Gravitational Wave Science



FY 2023 HEP Early Career Awards: Laboratory

- ▶ **Matthew Becker, ANL**
 - ▶ Accurate and Precise Weak Lensing Analyses for Cosmological Survey
- ▶ **Christian Boutan, PNNL***
 - ▶ Towards a quantum-enhanced multi-cavity haloscope for high-mass QCD axion detection
- ▶ **Elizabeth Brost, BNL**
 - ▶ Shining light on the Higgs self-interaction
- ▶ **Lucas Brouwer, LBNL**
 - ▶ Fixed-Field Superconducting Magnets for Rapid, High Power Acceleration of Muons and Protons



* **First HEP Early Career Award at this Institution**



FY 2023 HEP Early Career Awards: Laboratory

- ▶ **Claudio Emma, SLAC**
 - ▶ Generating and diagnosing extreme beams for next-generation high energy physics and fundamental science experiment
- ▶ **Bernhard Mistlberger, SLAC**
 - ▶ Pushing the Boundaries of Precision: N3LO Predictions for the LHC
- ▶ **Guillermo Fernandez Moroni, FNAL**
 - ▶ Demonstrating enabling technologies for a spectroscopy instrument for the next cosmic survey
- ▶ **Silvia Zorzetti, FNAL**
 - ▶ Advancing Quantum Sensors and Sensor Networks with High-Efficiency Transduction



HEP Research Trends

- ▶ HEP FY22 budget included \$387M for Research which comprised 36% of total HEP budget.
 - ▶ As a fraction of the HEP total this is an increase over FY19-20 and slightly below FY21.
 - ▶ Still below 40% target of previous P5 and HEP COV
- ▶ In total dollars, HEP Research has been growing at about 4% per year since FY19, but these totals include HEP-QIS and (in prior years) Accelerator Stewardship, which are not included in core HEP research as defined by COV.
- ▶ Core HEP totals *do* include subprogram AIML funding since FY20
 - ▶ Leveraging this initiative has been essential to maintaining core-funded effort ~constant (or only slightly declining) at universities in recent years
 - ▶ Lab HEP core research has been ~constant dollars, but larger impact from QIS
 - ▶ Impacts also vary by subprogram
- ▶ Research initiatives are generally expected to continue, but budget trajectory is uncertain

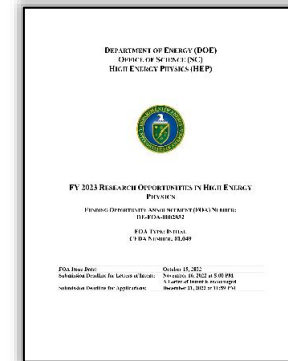
FY 2024 Planned HEP Funding Opportunities

Funding Opportunity	Est. Timeline	Notes
FY 2024 Continuation of....	Released 10/22 Proposals due 12/22 [exact dates TBD]	HEP Comparative Review to be part of SC Open Call in FY24. See following slides.
U.S.-Japan Science and Technology Cooperation Program In High Energy Physics	Released 10/22 Proposals due 12/22 [exact dates TBD]	Lab only, univ may partner via subawards
FY 2024 SC Early Career Research Program (SC-wide)	Release TBD	Univ + Lab.
RENEW-HEP (or SC-wide?)	Release TBD	Univ + Lab. Partnerships encouraged. May be single SC FOA.
FAIR (SC-wide)	Release TBD	Univ only.
ACCELERATE (SC-wide)	Release TBD	Lab only. Advanced Technology R&D program.
HEP-QIS (re-compete)	Release TBD	Lab +Univ. Further details TBA.



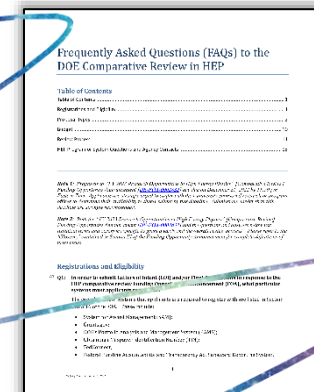
FY 2023 HEP Comparative Review FOA and FAQ

- ▶ **DE FOA-0002832** issued: **October 19, 2022**
- ▶ **Six core HEP research subprograms**
 - ▶ Energy, Intensity, and Cosmic Frontiers
 - ▶ HEP Theory, Accelerator Science and Technology R&D, and Detector R&D
- ▶ **Letter of Intent (strongly encouraged) due: November 16, 2022**
- ▶ **Final Proposal deadline: December 21, 2022**
- ▶ **Review process: January – March 2023**



PIs and university SROs should read the FOA carefully to comply with all requirements prior to submitting a proposal.

- ▶ **In addition to the FOA, an FAQ is available to address topics:**
 - ▶ Registration and eligibility requirements
 - ▶ Proposal types and requirements;
 - ▶ Guidance for new faculty and those without current grants
 - ▶ Guidance for PIs with existing HEP grants
 - ▶ Budget information and guidance on scope of request(s)
 - ▶ Letter of Intent
 - ▶ Information on overall scientific merit review process
 - ▶ Contacts for program- or system-related questions



The FOA, FAQ, and a recording of an informational webinar are available at: <https://science.osti.gov/grants/FOAs/Open>

Important Changes in FY24 HEP Comparative Review

To help resolve scheduling issues from multiple overlapping FOAs, we are working to move the HEP Comparative Review process to earlier in the Fiscal Year.

For FY24+, this means **changing the application process:**

- ▶ **No stand-alone HEP Comparative Review FOA**
- ▶ **Applications will be accepted through the FY24 SC Open Call (release in Oct)**
- ▶ **FY24 Proposals (New and Renewals) will be due in ~early December 2023**
- ▶ FY25 Proposals will be due in ~Sept 2024.

Check Open Call FOA for exact dates, when issued

Because the SC Open Call has somewhat different requirements, there will be differences in detail from “traditional” HEP Comparative Review FOA: page limits, appendices, budget forms, etc. [Read the FOA when it is issued!](#)

- ▶ **To be discussed in detail at HEP PI Meeting**

HEP PI Meeting Aug 15-16 (virtual)

- ▶ See also save-the-date letter sent out to PIs in mid-July. Program includes:
 - ▶ high-level plenary talks by HEP management
 - ▶ detailed discussion of upcoming HEP funding opportunities
 - ▶ Early Career, workforce development, DEIA presentations
 - ▶ parallel sessions with all your favorite program managers
 - ▶ Time reserved for Q&A. Can submit questions in advance to HEP@orau.org
- ▶ Not just for PIs – lab staff, postdocs, others welcome!
- ▶ Register Now! <https://www.orau.gov/heppi2023>
- ▶ Day 1 plenaries will be recorded for streaming.

HEP Office Comings & Goings

▶ Incoming:

- ▶ New Facilities PMs: Joe Diehl (Projects), Eric Feng (Fac. Ops)
- ▶ New Research PMs: HEP QIS, Cosmic Frontier (offers out)
 - AAAS Fellow: Jacqueline Smith, DEIA (Sep)
 - New Detailee in Intensity Frontier (coming this Fall)



▶ Outgoing:

- ▶ IPA/detailees: Karen Byrum, Cosmic Frontier (March) → ANL
- > Pathways Intern : Aidan Jalili, Cosmic (Aug)

▶ Always looking for candidates to help with critical tasks

- ▶ Interested parties should contact HEP Management!
- ▶ Investigating alternate hiring opportunities beyond IPAs and Detailees



Summary

- ▶ FY23 HEP Comparative Review had high proposal success rates, and some good markers for program diversity, but also reflects challenges in attracting new institutions to HEP.
- ▶ RENEW and FAIR offer unprecedented opportunities to re-build and expand the HEP community
- ▶ DOE/SC research initiatives have also provided additional resources in targeted areas that compliment and support HEP Research and particular technology R&D areas.
- ▶ Outlook for Research funding and FY24 FOAs dependent on Congressional action, both in total \$\$ and specific additional guidance
- ▶ **HEP Comparative Review → SC Open Call in FY24+**
- ▶ Come to the HEP PI meeting next week for much more info!



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HEP Accelerator Traineeship Program

- **A number of studies indicate a shortfall in the number of domestically trained accelerator physicists and engineers employed at DOE labs (including HEPAP study in 2014)**
- Shortfalls are expected to occur in four major areas:
 - Physics of large accelerators and systems engineering
 - Superconducting RF accelerator physics and engineering
 - Radiofrequency power system engineering
 - Cryogenics systems engineering
- Graduate-level traineeship program created to address these needs
- **First FOA published in 2017, 4 awards to date**
 - FY17: MSU, provided supplemental funds for FY22, expect renewal proposal in FY23
 - FY19: 2 awards, SBU and IIT
 - FY21: ODU
- **FY23 FOA expected issue date: early 2023**
 - Both new and renewal applications will be accepted

